

Remarks

The amendments to the Specification

5 Examiner will immediately see that the changes in the title and elsewhere of "two-stage
commit" to --two-phase commit-- serve only to make the terminology consistent throughout the
Specification and claims. The amendment at page 19 makes the reference numbers at that point
in the Specification consistent with those in the Figures and the amendment at page 22, lines 10-
13 simply removes irrelevant material remaining from a draft of the application. As will be
10 immediately apparent from the foregoing, the amendments to the Specification add no new
matter.

The amendments to the claims

Examiner will immediately see that the amendments to claims 2-10 are fully supported by the
15 Specification as filed, as is new claim 11. By their very nature, the Beauregard claims 12-21
dependent from claims 11, 2-10 are supported by the Specification as filed to the same extent
that claims 11, 2-10 are. Similarly, apparatus claims 22-31 are so closely related to method
claims 11, 2-10 that claims 22-31, too, are supported by the specification as filed to the same
extent as claims 11, 2-10.

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The rejections of the claims

The following discussion will first demonstrate that claims 1-10 as filed were not anticipated by
Lampson or Cabrera and will then show that new claim 11 clearly distinguishes Applicants'
invention from Hallmark. As will be apparent from the foregoing discussion of the amendments
25 to the claims, the relationship of claims 12-31 to claims 11, 2-10 is such that the arguments
made with regard to those claims apply equally to claims 12-31.

Traversal of the rejections on the basis of Lampson or Cabrera

The problem that is solved by Applicants' invention is optimizing transactions in distributed
30 systems by reducing both the number of messages between the systems required for the
transaction and the amount of processing within a system required for the transaction. The
solution that is claimed in independent claims 1, 5, 9, and 10 as filed requires *augmented*

transaction messages that are augmented with state information about the state of the system sending the message with regard to the transaction and one system which retains the state information from the augmented transaction messages and uses the retained state information in performing the transaction. A preferred embodiment of the augmented messages and the retained state information is discussed at page 18, line 1-page 19, line 9. Fig. 4 shows an augmented message 401 with state information 407 and retained state 415 in outgoing link table 409. Neither Lampson nor Cabrera discloses anything like augmented messages or the retention of the state information from the augmented messages in one of the distributed systems for use in performing the transaction. Thus, neither of these references anticipates Applicants' independent claims as filed.

Detailed rebuttal of the rejection based on Lampson

What Lampson discloses is techniques for reducing the number of writes to logs required for a transaction. The techniques do not employ state information received from augmented messages. In his discussion of Lampson, Examiner cites Lampson's FIGs. 20 and 20a as showing Applicants' augmented messages, but there is nothing in the Figures or the discussion of the figures at col. 13, line 31-col. 14, line 50 to indicate in any way that the messages are *augmented* with information about the state of the sending system. Since there are no augmented messages, there can also be no retained state information received from such augmented messages that is used in performing the transaction. For this limitation, Examiner cites col. 13, lines 45-58, which only describes how Lampson's system writes an "abort" log record. There is no disclosure that the "abort log record" is used in performing the transaction, as required by the claims.

Detailed rebuttal of the rejection based on Cabrera

Cabrera discloses a technique for keeping track of which copies of data stored in a set of mirrored disks are currently up to date. To keep track, Cabrera associates a data structure of $2n$ bits with the data, where n is the number of mirrored disks. This data structure is termed a *cohort set*. Again, the technique does not employ state information received from augmented messages. In his discussion of Cabrera, Examiner cites col. 7, lines 16-22 as disclosing the augmented messages, but what is described there is how the cohort sets are modified. The modification of the cohort sets does not depend on information from augmented messages. Examiner cites col. 7, lines 5-15 and FIG. 6 as showing how the relevant state is retained, but

the cited location describes the cohort sets, which do retain state, but not state obtained from augmented messages, as required by the claims.

The rejection based on Hallmark

5 The problem addressed by Hallmark is ensuring that all copies of a distributed transaction have the same *system commit number* (SCN). SCNs are monotonically increasing values that are used in the database system in which Hallmark's invention is implemented to determine the order in which transactions have occurred. Hallmark solves the problem by "piggybacking" SCN numbers from the systems involved in the transaction on the messages used for the two-
10 phase commit protocol. The "piggybacked" SCNs are compared in the coordinator and the coordinator broadcasts the largest SCN (via piggyback?) to all of the systems involved in the transaction. Each of the systems then associates the broadcast SCN with the transaction. See col. 10, lines 30-64 and col. 14, lines 44-48.

15 A difference between what Hallmark discloses and Applicants' disclosure is that Hallmark's piggybacked SCN's have nothing to do with the way the 2-phase commit protocol itself is executed in Hallmark. To ensure this distinction is clear in Applicants' claims, Applicants have replaced claim 1 with claim 11 and have amended claim 5 to clearly distinguish what is set forth in the claims from Hallmark's technique involving piggybacked SCNs. Claim 11 is exemplary:

20 11. (new) A method of ensuring that a first component of a distributed system that exchanges messages belonging to a protocol for a transaction with one or more other components of the distributed system is additionally aware of a state of an other component, the state being relevant to the protocol and the method comprising the steps practiced in the first component of:

25 receiving an augmented one of the messages, the augmented message having been augmented by the other component to additionally contain information indicating the relevant state of the other component;

retaining the relevant state from the augmented message; and

using the retained relevant state to optimize the protocol.

30 Beginning with the preamble, the preamble now sets forth that the messages "belong to a protocol for a transaction" and that the first component "is additionally aware of a state of the other component, the state being relevant to the protocol". As already pointed out, in Hallmark, the values of the SCN's are not "state [that is] relevant to the protocol". Continuing with the body of the claim, the "augmented message" has been augmented "to additionally contain

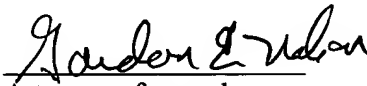
information indicating the relevant state of the other component", where "relevant state" is, as set forth in the preamble, "relevant to the protocol". The SCN's retained in Hallmark are of course not relevant to the protocol, and thus cannot be the state that is retained in the step of "retaining the relevant state", and finally, Hallmark's retains SCNs are not "used . . . to optimize the protocol", as required by the claim's last step. Claim 11 is thus not anticipated by Hallmark, and since none of the other references show any kind of augmented messages, Hallmark cannot be combined with any of the other references to render the claim obvious.

Examiner will immediately see that the arguments just made with regard to claim 11 apply equally to claim 5 as amended and to claims 9 and 10. Further, dependent claims 2 and 3 and 6 and 7 set forth further details of the "information indicating the relevant state" and of the manner in which the "retained relevant state" is used to "optimize the protocol" and are thus patentable in their own rights over Hallmark. Finally, Examiner will immediately see that new claims 12-31 are patentable over Hallmark and the other references for the same reasons that claims 11 and 2-10 are patentable.

Conclusion

Applicants have amended their Specification to correct problems noted therein by Applicants, have traversed the rejections of the originally-filed claims as anticipated by Lampson or Cabrera, and have amended their claims to better distinguish them from Hallmark. The amendments to the Specification do not add new matter and the claims as amended are supported by the Specification as filed. Applicants have thus satisfied the requirements of 37 C.F.R. 1.111(b) and respectfully request that Examiner continue with his examination of the claims as amended, as provided by 37 C.F.R. 1.111(a). Enclosed with this response is a check in the amount of \$524 for the claims added by way of this amendment. Please charge any additional fees required for the amendment or refund any overpayments to deposit account number 501315.

Respectfully submitted,


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